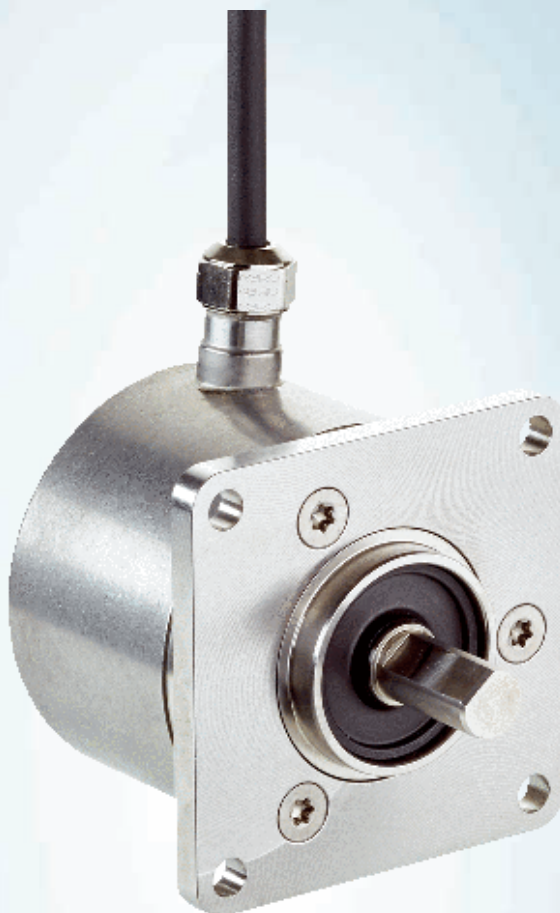




# AFM60I-Q4SM262144

AFS/AFM60 SSI

**ABSOLUTE ENCODERS**

**SICK**  
Sensor Intelligence.



Illustration may differ

## Ordering information

| Type              | part no.   |
|-------------------|------------|
| AFM60I-Q4SM262144 | On request |

Other models and accessories → [www.sick.com/AFS\\_AFM60\\_SSI](http://www.sick.com/AFS_AFM60_SSI)

## Detailed technical data

## Safety-related parameters

|                                                          |                                          |
|----------------------------------------------------------|------------------------------------------|
| <b>MTTF<sub>D</sub> (mean time to dangerous failure)</b> | 250 years (EN ISO 13849-1) <sup>1)</sup> |
|----------------------------------------------------------|------------------------------------------|

<sup>1)</sup> This product is a standard product and does not constitute a safety component as defined in the Machinery Directive. Calculation based on nominal load of components, average ambient temperature 40 °C, frequency of use 8760 h/a. All electronic failures are considered hazardous. For more information, see document no. 8015532.

## Performance

|                                                                                 |                                   |
|---------------------------------------------------------------------------------|-----------------------------------|
| <b>Number of steps per revolution (max. resolution)</b>                         | 262,144 (18 bit)                  |
| <b>Number of revolutions</b>                                                    | 4,096 (12 bit)                    |
| <b>Max. resolution (number of steps per revolution x number of revolutions)</b> | 18 bit x 12 bit (262,144 x 4,096) |
| <b>Error limits G</b>                                                           | 0.03° <sup>1)</sup>               |
| <b>Repeatability standard deviation <math>\sigma_r</math></b>                   | 0.002° <sup>2)</sup>              |

<sup>1)</sup> In accordance with DIN ISO 1319-1, position of the upper and lower error limit depends on the installation situation, specified value refers to a symmetrical position, i.e. deviation in upper and lower direction is the same.

<sup>2)</sup> In accordance with DIN ISO 55350-13; 68.3% of the measured values are inside the specified area.

## Interfaces

|                                           |                                                    |
|-------------------------------------------|----------------------------------------------------|
| <b>Communication interface</b>            | SSI                                                |
| <b>Communication Interface detail</b>     | SSI + Sin/Cos                                      |
| <b>Initialization time</b>                | 50 ms <sup>1)</sup>                                |
| <b>Position forming time</b>              | < 1 µs                                             |
| <b>Code type</b>                          | Gray                                               |
| <b>Code sequence parameter adjustable</b> | CW/CCW (V/R)                                       |
| <b>Interface signals</b>                  | Sin+, Sin-, Cos+, Cos-: analog, differential       |
| <b>Clock frequency</b>                    | 2 MHz <sup>2)</sup>                                |
| <b>Set (electronic adjustment)</b>        | H-active (L = 0 - 3 V, H = 4,0 - U <sub>s</sub> V) |

<sup>1)</sup> Valid positional data can be read once this time has elapsed.

<sup>2)</sup> SSI max. clock frequency 2 MHz, and min. LOW level (Clock+): 500 ns.

|                                                     |                                          |
|-----------------------------------------------------|------------------------------------------|
| <b>CW/CCW (counting sequence when turning)</b>      | L-active (L = 0 - 1,5 V, H = 2,0 - Us V) |
| <b>Sine/cosine periods per revolution</b>           | 1,024                                    |
| <b>Output frequency</b>                             | ≤ 200 kHz                                |
| <b>Load resistance</b>                              | ≥ 120 Ω                                  |
| <b>Signal before differential generation</b>        | 0.5 V <sub>pp</sub> , ± 20 %, 120 Ω      |
| <b>Signal offset before differential generation</b> | 2.5 V ± 10 %                             |
| <b>Signal after differential generation</b>         | 1 V <sub>pp</sub> , ± 20 %, 120 Ω        |

<sup>1)</sup> Valid positional data can be read once this time has elapsed.

<sup>2)</sup> SSI max. clock frequency 2 MHz, and min. LOW level (Clock+): 500 ns.

## Electronics

|                                    |                             |
|------------------------------------|-----------------------------|
| <b>Connection type</b>             | Cable, 12-wire, radial, 5 m |
| <b>Supply voltage</b>              | 4.5 ... 32 V DC             |
| <b>Power consumption</b>           | ≤ 0.5 W (without load)      |
| <b>Reverse polarity protection</b> | ✓                           |

## Mechanics

|                                       |                                       |
|---------------------------------------|---------------------------------------|
| <b>Mechanical design</b>              | Solid shaft, Square flange            |
| <b>Shaft diameter</b>                 | 10 mm                                 |
| <b>Shaft length</b>                   | 19 mm                                 |
| <b>Characteristics of the shaft</b>   | With flat                             |
| <b>Weight</b>                         | 0.5 kg <sup>1)</sup>                  |
| <b>Shaft material</b>                 | Stainless steel V2A                   |
| <b>Flange material</b>                | Stainless steel V2A                   |
| <b>Housing material</b>               | Stainless steel V2A                   |
| <b>Start up torque</b>                | 1 Ncm (+20 °C)                        |
| <b>Operating torque</b>               | 0.5 Ncm (+20 °C)                      |
| <b>Permissible shaft loading</b>      | 80 N (radial)<br>40 N (axial)         |
| <b>Operating speed</b>                | 9,000 min <sup>-1</sup> <sup>2)</sup> |
| <b>Moment of inertia of the rotor</b> | 6.2 gcm <sup>2</sup>                  |
| <b>Bearing lifetime</b>               | 3.0 x 10 <sup>9</sup> revolutions     |
| <b>Angular acceleration</b>           | ≤ 500,000 rad/s <sup>2</sup>          |

<sup>1)</sup> Based on devices with male connector.

<sup>2)</sup> Allow for self-heating of 3.3 K per 1,000 rpm when designing the operating temperature range.

## Ambient data

|                                      |                                                                                  |
|--------------------------------------|----------------------------------------------------------------------------------|
| <b>EMC</b>                           | According to EN 61000-6-2 and EN 61000-6-3 <sup>1)</sup>                         |
| <b>Enclosure rating</b>              | IP67, shaft side (IEC 60529)<br>IP67, housing side, cable connection (IEC 60529) |
| <b>Permissible relative humidity</b> | 90 % (Condensation not permitted)                                                |

<sup>1)</sup> EMC according to the standards quoted is achieved if shielded cables are used.

<sup>2)</sup> Stationary position of the cable.

<sup>3)</sup> Flexible position of the cable.

|                                    |                                                                      |
|------------------------------------|----------------------------------------------------------------------|
| <b>Operating temperature range</b> | -40 °C ... +100 °C <sup>2)</sup><br>-30 °C ... +100 °C <sup>3)</sup> |
| <b>Storage temperature range</b>   | -40 °C ... +100 °C, without package                                  |
| <b>Resistance to shocks</b>        | 100 g, 6 ms (EN 60068-2-27)                                          |
| <b>Resistance to vibration</b>     | 10 g, 10 Hz ... 2,000 Hz (EN 60068-2-6)                              |

<sup>1)</sup> EMC according to the standards quoted is achieved if shielded cables are used.

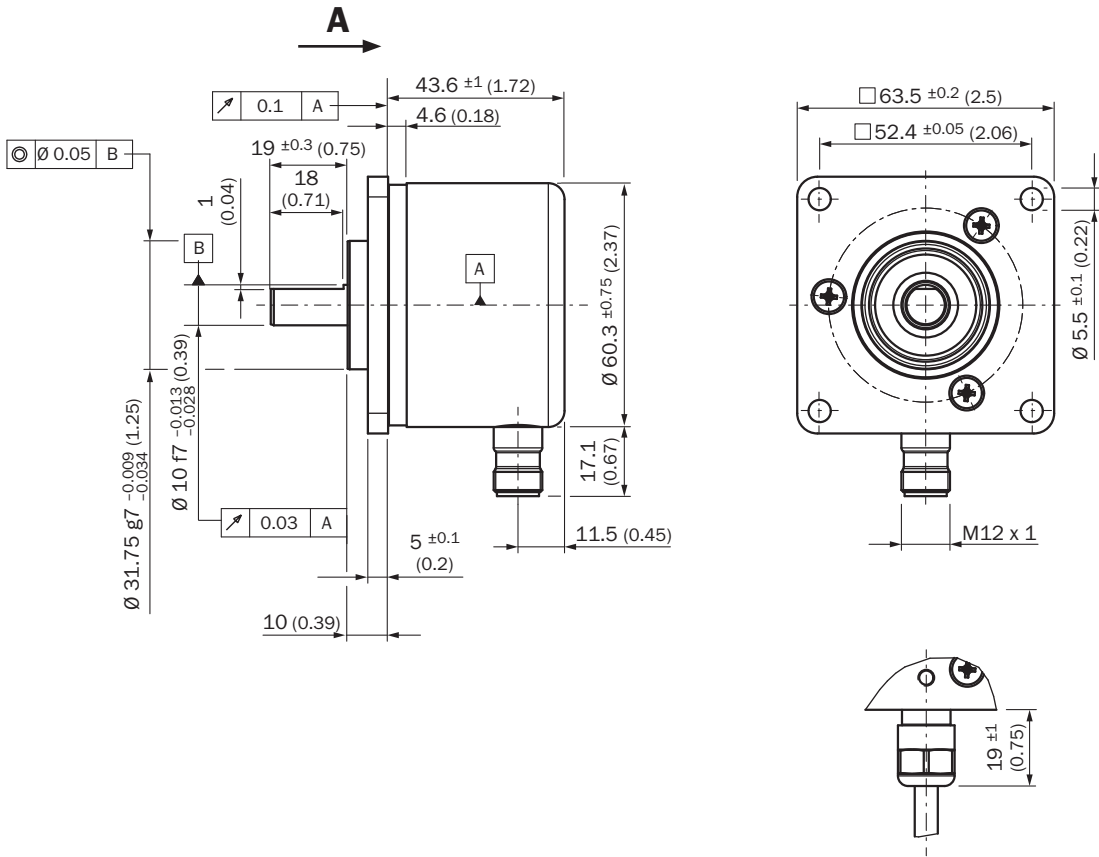
<sup>2)</sup> Stationary position of the cable.

<sup>3)</sup> Flexible position of the cable.

### Classifications

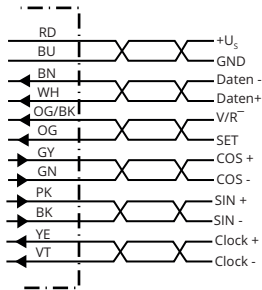
|                       |          |
|-----------------------|----------|
| <b>ECLASS 5.0</b>     | 27270502 |
| <b>ECLASS 5.1.4</b>   | 27270502 |
| <b>ECLASS 6.0</b>     | 27270590 |
| <b>ECLASS 6.2</b>     | 27270590 |
| <b>ECLASS 7.0</b>     | 27270502 |
| <b>ECLASS 8.0</b>     | 27270502 |
| <b>ECLASS 8.1</b>     | 27270502 |
| <b>ECLASS 9.0</b>     | 27270502 |
| <b>ECLASS 10.0</b>    | 27270502 |
| <b>ECLASS 11.0</b>    | 27270502 |
| <b>ECLASS 12.0</b>    | 27270502 |
| <b>ETIM 5.0</b>       | EC001486 |
| <b>ETIM 6.0</b>       | EC001486 |
| <b>ETIM 7.0</b>       | EC001486 |
| <b>ETIM 8.0</b>       | EC001486 |
| <b>UNSPSC 16.0901</b> | 41112113 |

Dimensional drawing



Dimensions in mm (inch)

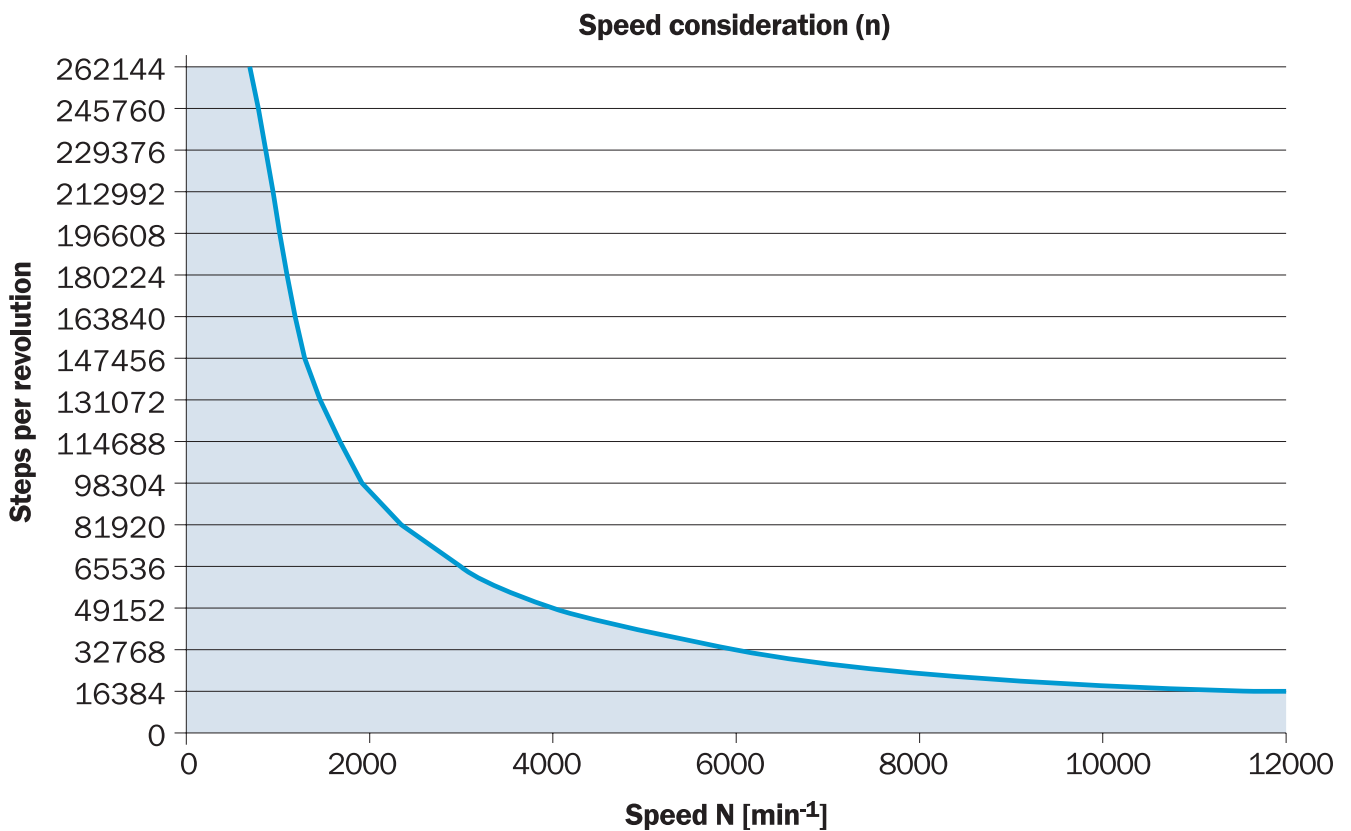
PIN assignment



| Male connector M12, 8-pin | Connector M12, 12-pin | Wire colors (cable connection) | SignalIncremental | SignalSin/Cos   | Explanation                       |
|---------------------------|-----------------------|--------------------------------|-------------------|-----------------|-----------------------------------|
| 3                         | 1                     | Orange/black                   | V/R               | V/R             | Sequence in direction of rotation |
| 2                         | 2                     | White                          | Data +            | Data +          | Interface signals                 |
| 1                         | 3                     | Brown                          | Data -            | Data -          | Interface signals                 |
| 6                         | 4                     | Violet                         | Clock -           | Clock -         | Interface signals                 |
| 8                         | 5                     | Red                            | +U <sub>s</sub>   | +U <sub>s</sub> | Operating voltage                 |
| -                         | 6                     | Gray                           | A                 | + COS           | Signal cable                      |

| Male connector M12, 8-pin | Connector M12, 12-pin | Wire colors (cable connection) | SignalIncremental | SignalSin/Cos | Explanation                                                                       |
|---------------------------|-----------------------|--------------------------------|-------------------|---------------|-----------------------------------------------------------------------------------|
| -                         | 7                     | Green                          | A <sup>-</sup>    | - COS         | Signal cable                                                                      |
| 4                         | 8                     | Pink                           | B                 | + SIN         | Signal cable                                                                      |
| -                         | 9                     | Black                          | B <sup>-</sup>    | - SIN         | Signal cable                                                                      |
| -                         | 10                    | Orange                         | SET               | SET           | Electronic adjustment                                                             |
| 5                         | 11                    | Yellow                         | Clock +           | Clock +       | Interface signals                                                                 |
| 7                         | 12                    | Blue                           | GND               | GND           | Ground connection                                                                 |
| -                         | -                     | -                              | Screen            | Screen        | Screen connected to housing on encoder side. Connected to ground on control side. |

### Diagrams



The maximum speed is also dependent on the shaft type.

## SICK AT A GLANCE

SICK is one of the leading manufacturers of intelligent sensors and sensor solutions for industrial applications. A unique range of products and services creates the perfect basis for controlling processes securely and efficiently, protecting individuals from accidents and preventing damage to the environment.

We have extensive experience in a wide range of industries and understand their processes and requirements. With intelligent sensors, we can deliver exactly what our customers need. In application centers in Europe, Asia and North America, system solutions are tested and optimized in accordance with customer specifications. All this makes us a reliable supplier and development partner.

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